THE ANNUAL AND GEOGRAPHICAL DISTRIBUTION OF THUNDERSTORMS AND SQUALLS ON THE NORTH ATLANTIC AND ADJACENT COASTS.

By W. KÖPPEN.

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By means of dividing the Atlantic Ocean into squares of latitude and longitude and noting from ships' logs the frequency with which thunderstorms and squalls were observed in each, the author has obtained a very large quantity of data which is probably quite accurate. The tables presented are elaborate and it must suffice merely to mention the results. For thunderstorms, in the northerly latitudes, for that portion of the Atlantic lying between France and Newfoundland, the greatest frequency occurs in the winter on the eastern side of the ocean and in summer on the western side. Off the African coast, the frequency is also greater in winter and spring than in summer and fall. In the equatorial regions between the South American and African coasts the maximum shifts from autumn through winter to spring as the Equator is approached. At Lat. 16° N., Long. 25° W., the maximum occurs in September; following the same meridian southward, we find the maximum in November at Lat. 9° N., in December at 5° N., and in March and April between 3° N. and 1° S. latitude. Comparisons are made with the frequency on adjacent coasts, and it is found that on the northern European and North American coasts the maximum occurs in midsummer, in southern Europe and Asia Minor the maximum tends toward the autumn.

The maximum squall frequencies occur in the fall, winter, and spring months, shifting from fall through winter to spring with progress southward.—*C. L. M.*

WIND CIRCULATION AS A BASIS FOR FORECASTING THE LOCATION OF PRESSURE AREAS.

By G. REBOUL and L. DUNOYER.

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In these two articles, the first entitled *Sur la prévisions des variations barométriques: vents d'appel pour les dépressions*, and the second, *Sur les actions mutuelles des basses pressions et des hautes pressions*, the authors present rules for the forecasting of the location of low and high pressure areas, by means of areas of winds which blow contrary to the normal circulation about such centers. These winds are called, in order to make clear the meaning of their use, "call winds" (*vents d'appel*) or winds which "call" the center of pressure upon the region over which they are blowing. The two rules which have been deduced are:

1. When there is in the vicinity of a depression a zone of winds which blow sensibly parallel from the interior of the depression, and in particular from its center, that depression is called onto the region covered by such winds.

2. When there is in the vicinity of a high-pressure area a zone of winds which blow sensibly parallel toward the interior of the area, this area is called onto the region covered by such winds.

A more definite idea of what is meant by *vents d'appel* is given by the example of a northerly wind over France which appears to be within the domain of the Iceland LOW but is really caused by the LOW on the Mediterranean. Thus the center of the Iceland LOW will be "called" in the direction of the region of the northerly winds. It is further remarked that this effect must be well marked at a number of stations, because a single station's observation may be influenced by the topographical character of the locality or the direction may be in error through inaccuracy of telegraphic transmission.

These rules are the result of study of 263 weather maps from the Bureau Central Météorológique for the LOWS and 246 for the HIGHS. The coefficients of certainty for each have been determined by months and by wind directions showing that, in the case of LOWS, the rule works more reliably in summer than in winter, the coefficients being 0.75 and 0.61, respectively. In the case of HIGHS, the coefficients are 0.74 and 0.58, respectively. With respect to wind directions, it appears that in both cases the northeast wind is the most likely to give the effect of "calling."

Three examples of the mutual action of HIGHS and LOWS are presented showing the use of the two rules. The first states that a depression tends to move about an area of high pressure in a clockwise manner. The winds of the northern part of a HIGH situated east of a LOW will tend to "call" the LOW; similarly, the winds in the southern part of a LOW tend to "call" the HIGH. The second asserts that in the case where a ridge of higher pressure separates two low centers, the winds flowing from the high-pressure ridge will constitute a call for winds from each of the low centers, thereby causing the union of the two centers and consequent increase in intensity of low pressure at the place of high pressure. The third case is that in which two high-pressure areas are separated by a valley of low pressure, and, in a manner similar to that above, the valley of low pressure will become the center of high pressure as the two HIGHS combine.—*C. L. M.*

A NOTE ON THE POSSIBILITY OF LONG-RANGE WEATHER FORECASTS.

By J. R. SUTTON.

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Long-range weather forecasts may be divided into three classes, first, the random guesses of so-called weather prophets; second, forecasts based on cycles; and third, forecasts based on recognized physical or statistical principles. The last, though limited in scope and less ambitious than the other two, is the only one upon which any reliance can be placed. For South Africa examples of such physical relationships are "Winter droughts at Durban have invariably been followed by summer droughts in Mauritius" (easterly drift of barometric depressions across the Indian Ocean); and the relationship between Antarctic temperatures during August and September and those of Kimberley during the following October to December (Antarctic ice moves east-northeast in the current that washes the west coast of South Africa.)

In the present paper the author has sought to find a physical relation between the rainfall of the latter half of May and the temperature of June. He finds that when the second half of May is wet, June days tend to be cooler and nights warmer than when the latter half of May is dry. Heavier rains toward the end of May mean fewer cold June nights, and it happens that the coldest June nights come near the end of the month when there has been much rainfall in late May.

The physical basis of this relationship is quite obvious, for dry ground will cool faster by radiation than wet ground will by evaporation and radiation combined. Similarly, because of the greater specific heat of wet ground, June days are cooler after a wet May.—*C. L. M.*